Baseline and Other Configurations

Configurations Under Study

- L2, 6 Spacecraft, 1.3M SXT
  - Baseline
- L2, 3 Spacecraft, 1.3M SXT (2)
  - Provides mass margin
  - Saves cost on fewer S/C buses as well as I&T
- LEO, 4 Spacecraft - (28^{o}), 1.8M SXT
  - Greatly increases throw weight capability of vehicle
  - Provides greater useable height in fairing (2 stage rocket)
  - Lower radiation environment than polar orbit

Alternative Mission Concepts

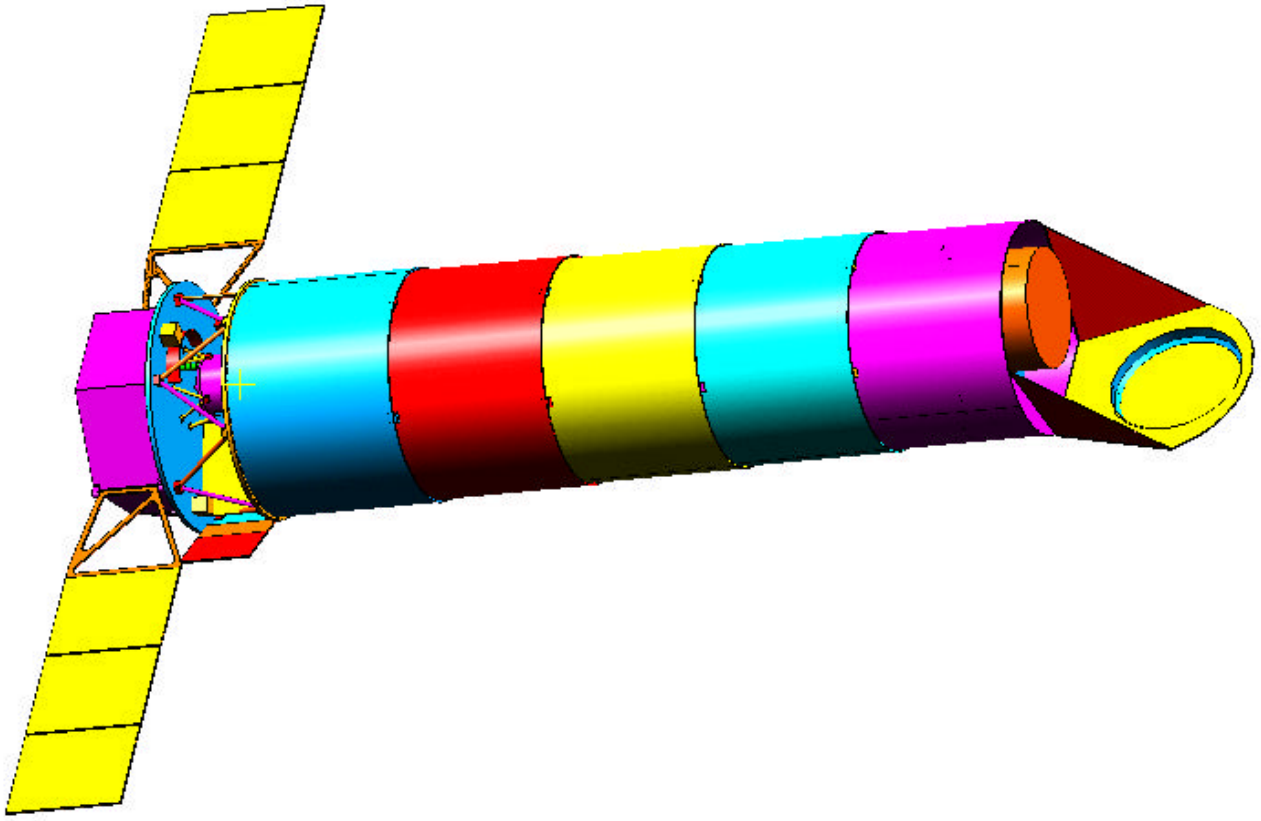
Configuration Alternative

	L2 Baseline	L2	LEO (28.7°)
Number of Satellites	6	3	4
SXT's per Satellite	1	2	1
SXT Configuration	1.3m Baseline	1.3m Baseline	1.9m
Geometric Area(cm^2)	30,000	30,000	64,000
SXT Effective Area (EA)			
@1keV(cm^2)	15,000	15,000	20,000
@6.4keV(cm^2)	6,000	6,000	
Viewing Efficiency	~93%	~93%	~50%
SXT EA x Efficiency	13,950	13,950	10,000
HXT's per Satellite	3	6	4
HXT Configuration	0.28m Base	0.28m Base	0.40m

Comparison of Orbit Options

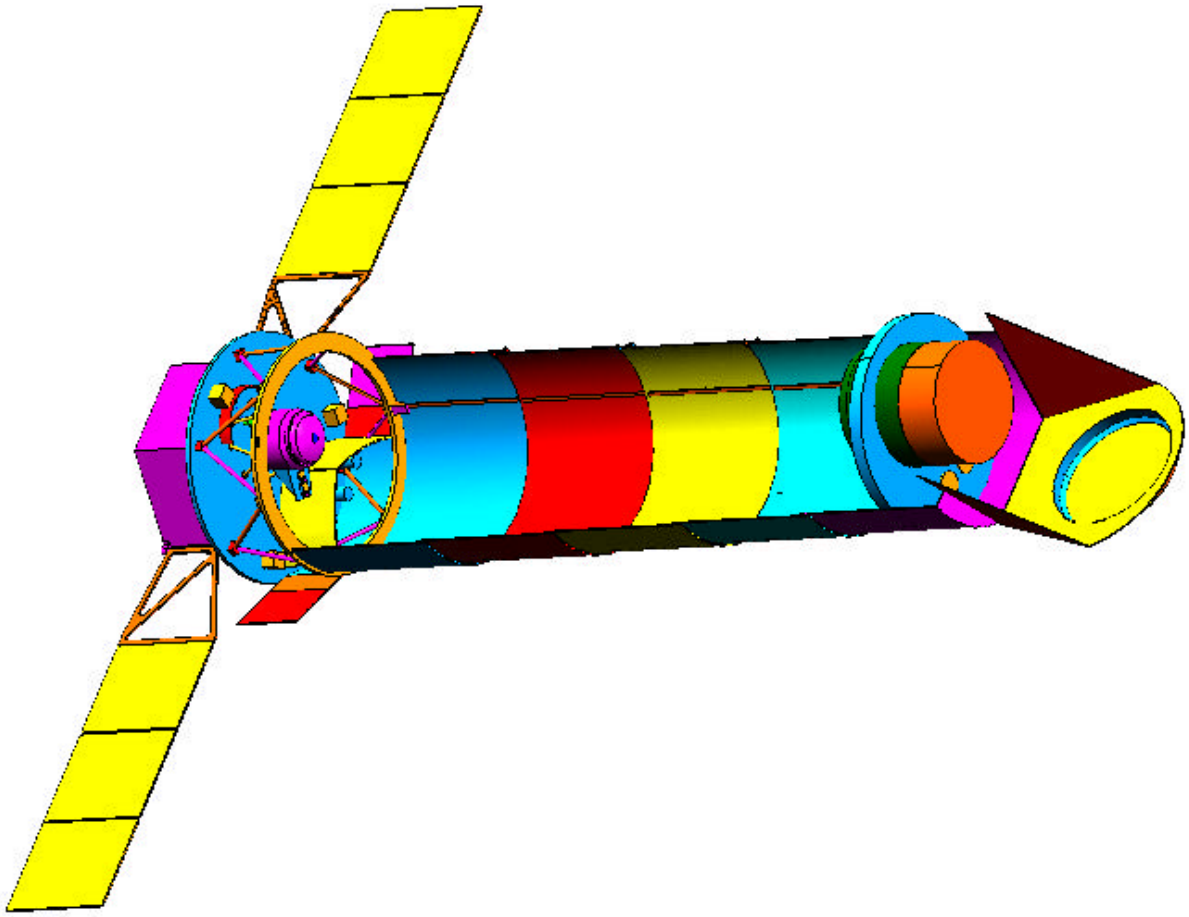
Orbit	**L2 (6 or 3 satellites)**	**LEO (28.7º)**
Launch Vehicle	6 Delta II 3 Atlas 2 or Delta III	4 Delta II
CCD, HXT Detector Cooling	Passive	Active (TEC?)
Microcalorimeter Cooling Loop	2 stage RTB	2 stage RTB w capillary pumped
Momentum Control Wheel	3 - 50 Nms wheels	2 - 300Nms wheels; 1 - 50 Nms
	hydrazine	Torquer bars (1-8 ft; 150 lbs)
Communications	1 m antenna + omni's	omni's
Ground Antenna	one 11 m	multiple 5 m
Solar Arrays	7.2 m2 fixed (6 sat.) 9.8 m2 fixed (3 sat.)	15.5 m2 articulated (TBD)
Batteries	Minimal	Larger to accommodate occults

L2 - 6 S/C (BASELINE)



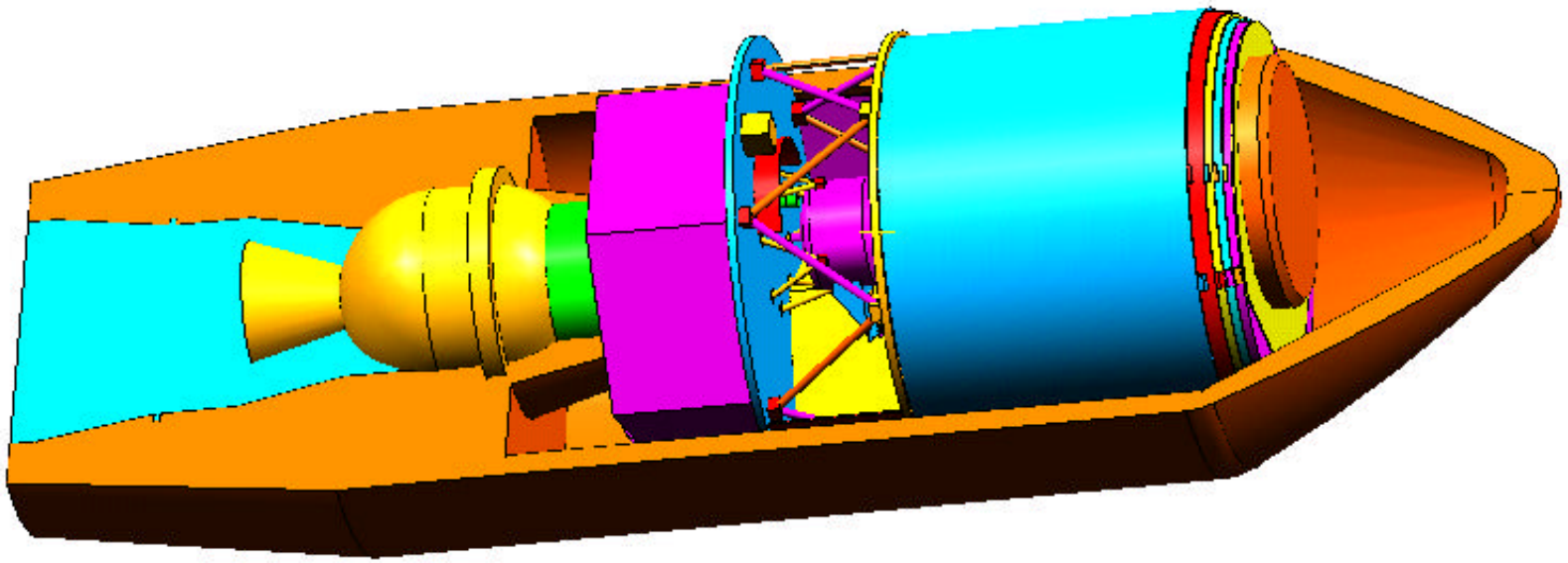
DIIL21.3M - DEPLOYED

L2 - 6 S/C (BASELINE)



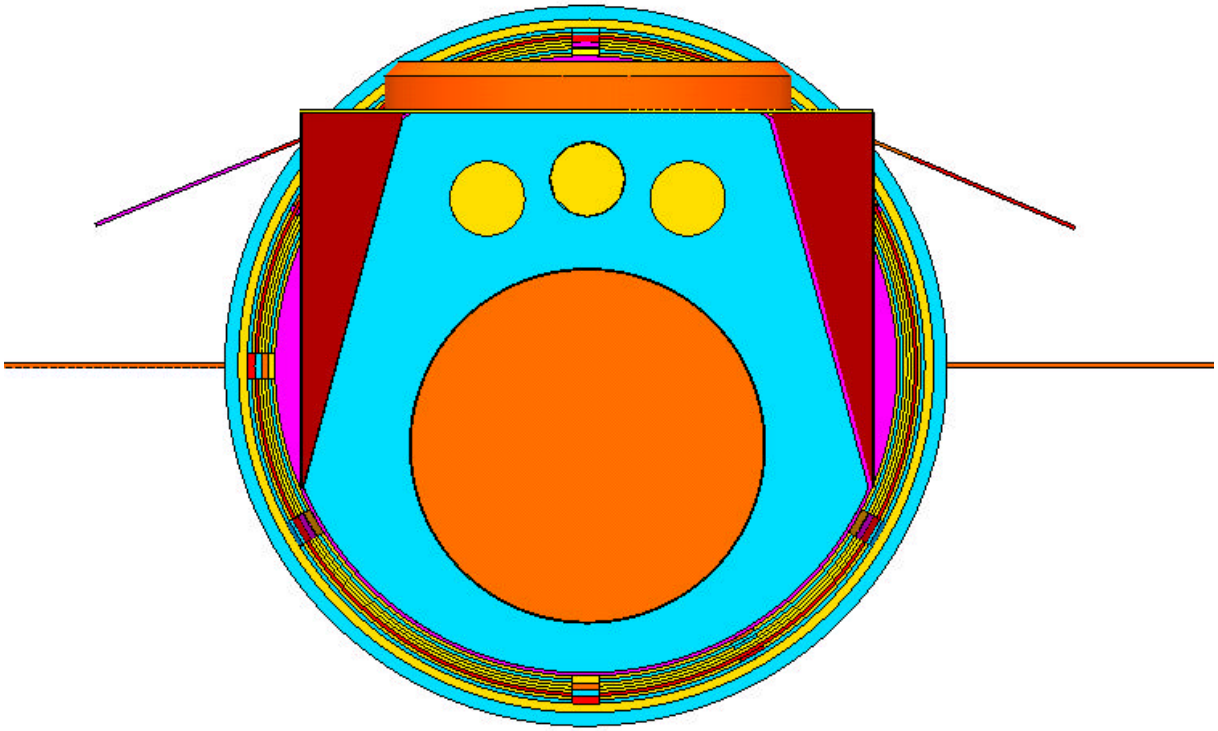
DIIL21.3M - CUTAWAY

L2 - 6 S/C (BASELINE)



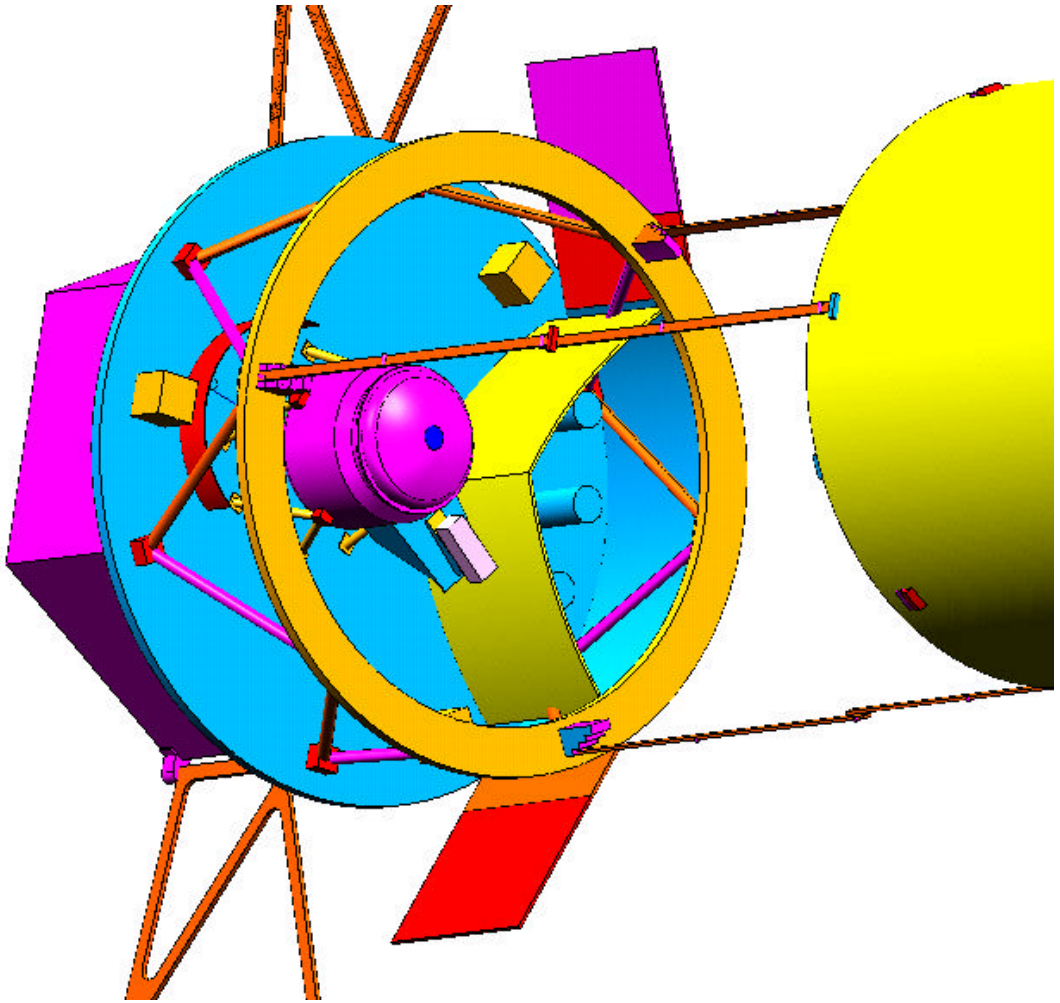
DIIL21.3M - STOWED

L2 - 6 S/C (BASELINE)



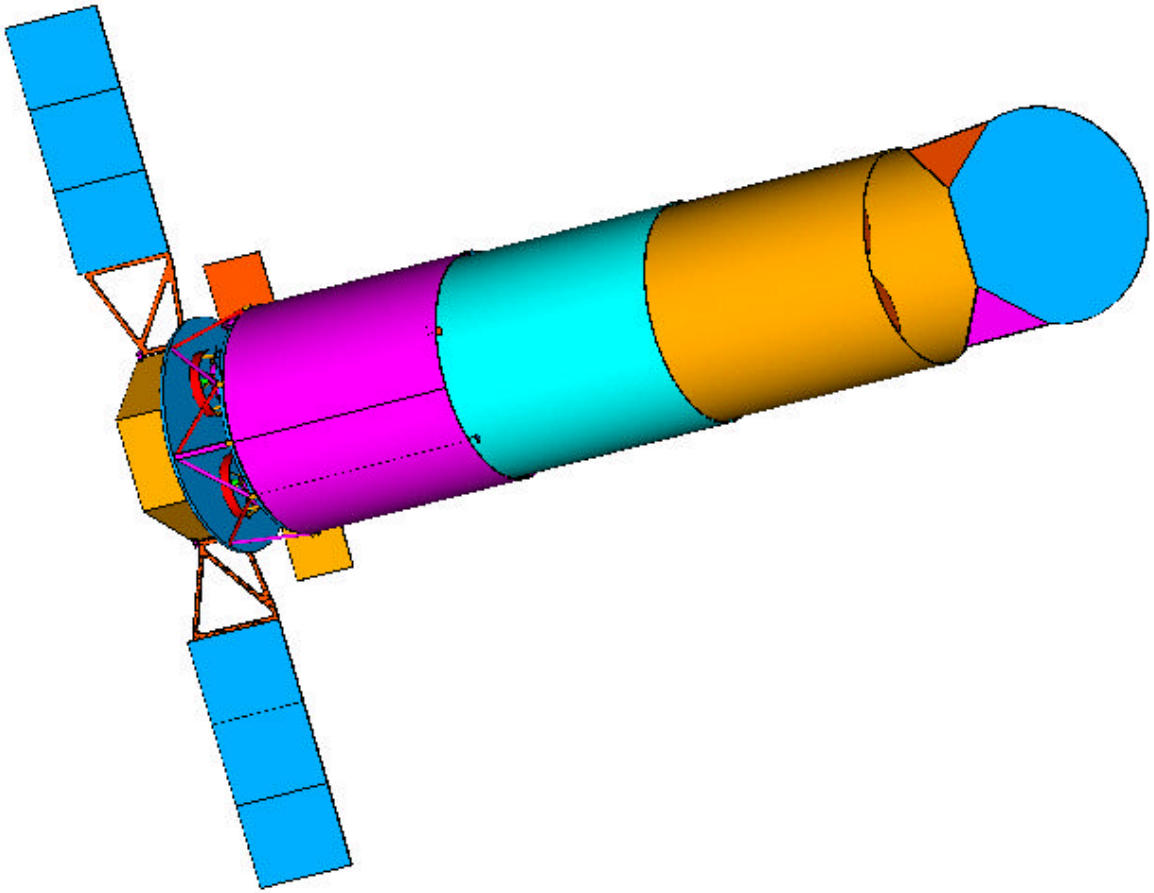
DIIL21.3M - TOP VIEW

L2 - 6 S/C (BASELINE)



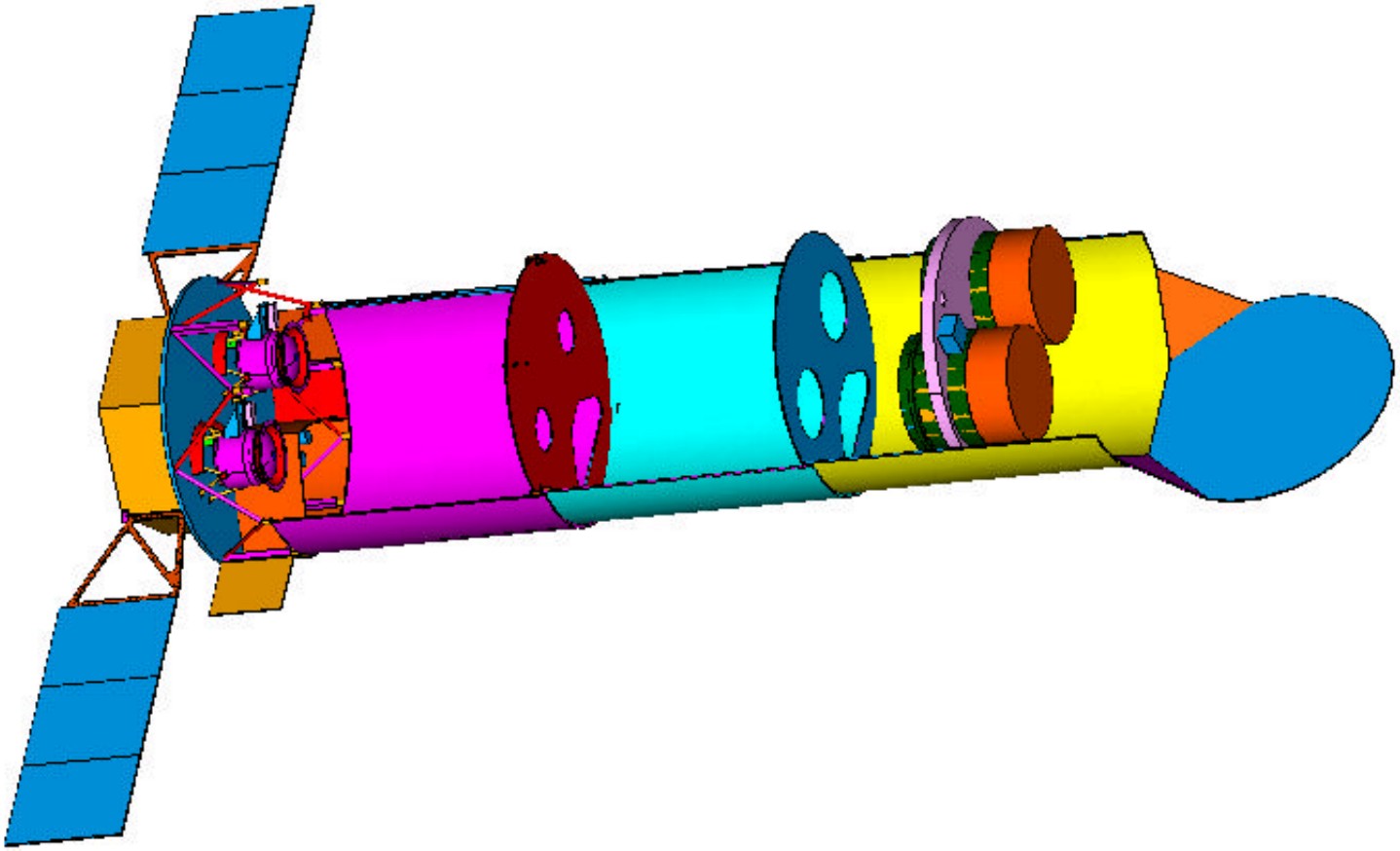
DIIL21.3M - DETECTOR END

L2 - 3 S/C



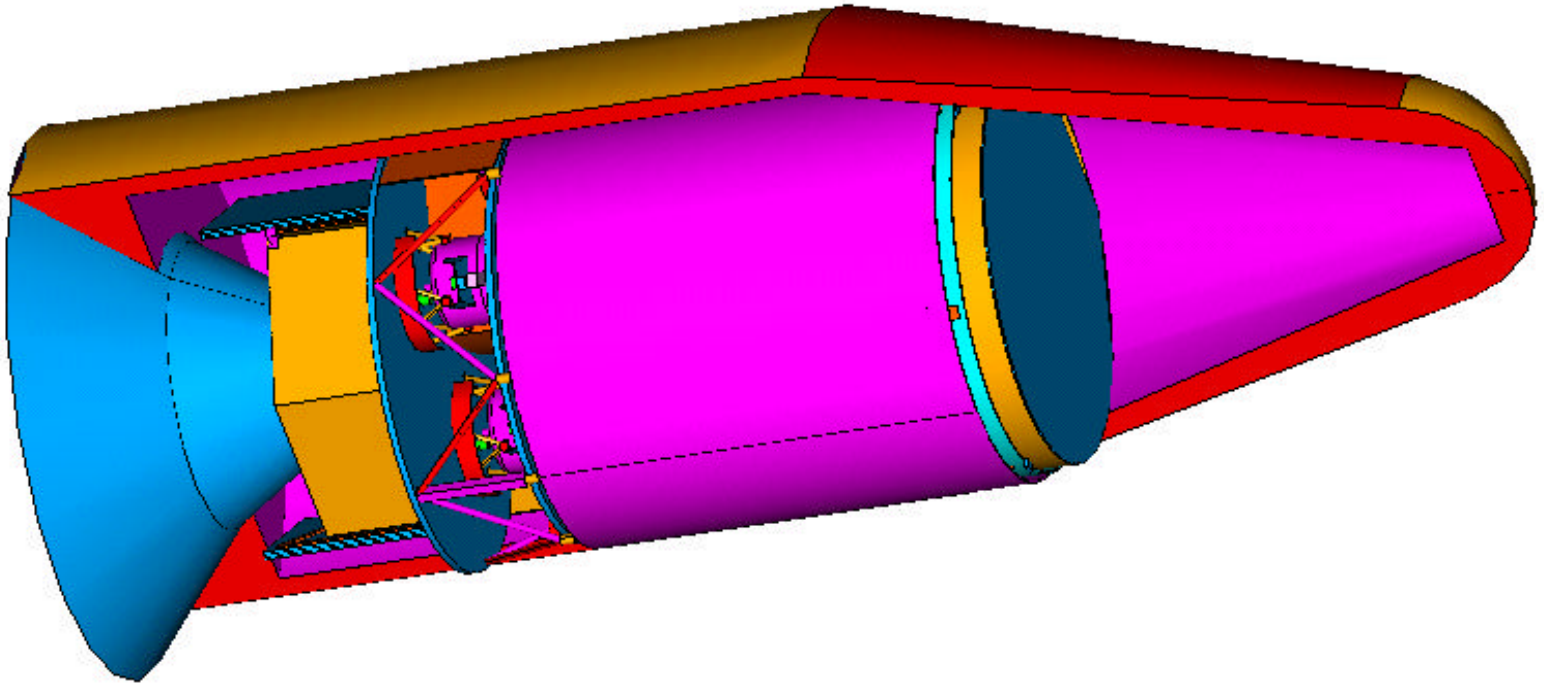
DIIIL21.3Mx2 - DEPLOYED

L2 - 3 S/C



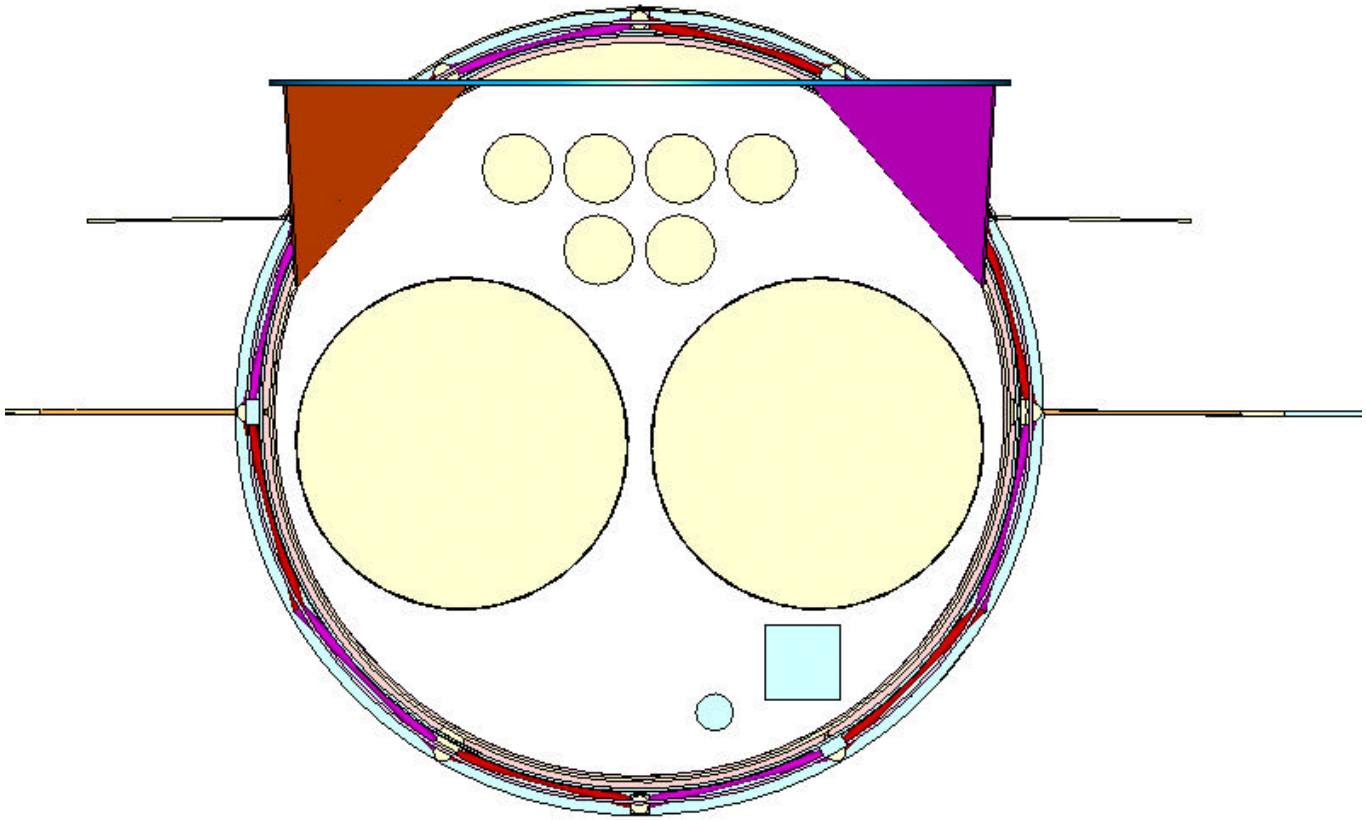
DIIIL21.3Mx2 - CUTAWAY

L2 - 3 S/C



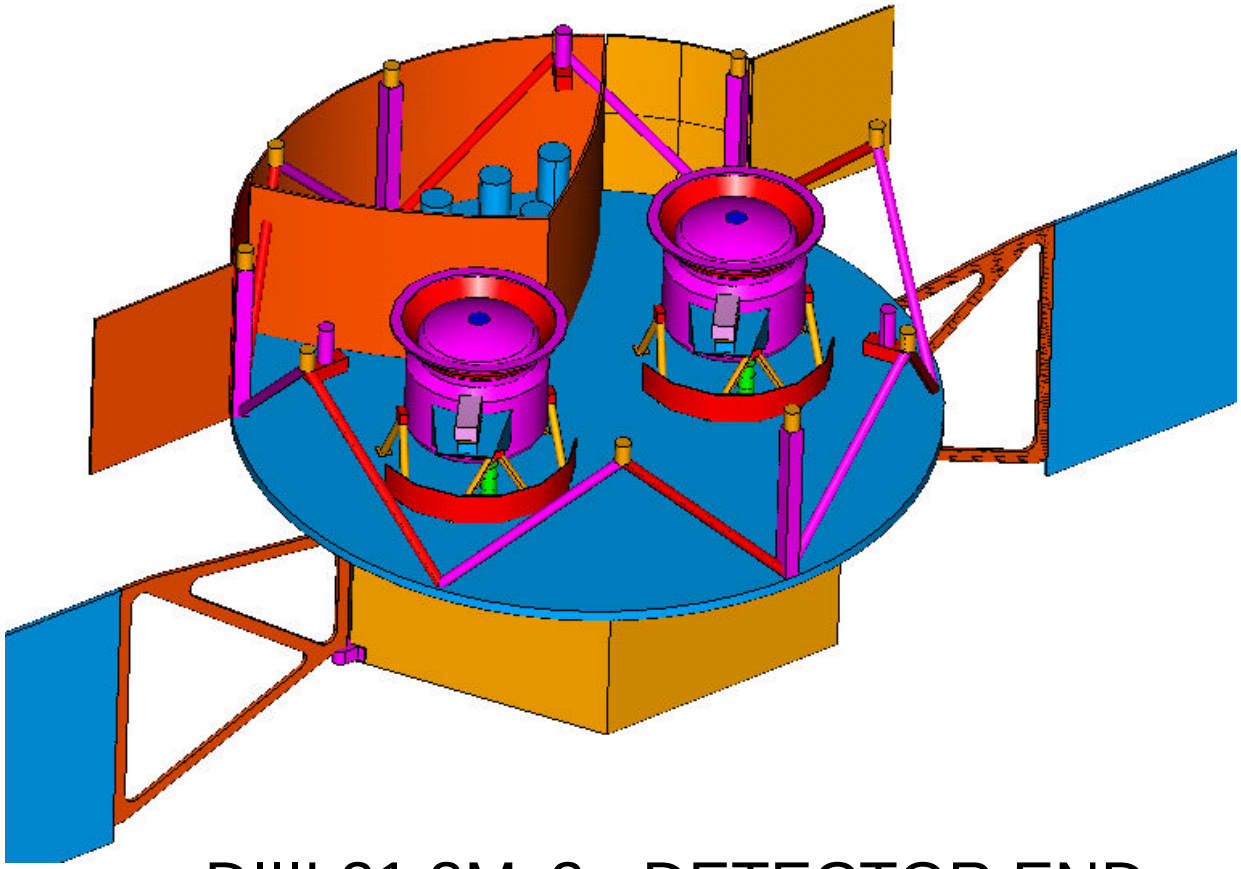
DIIIL21.3Mx2 - STOWED

L2 - 3 S/C



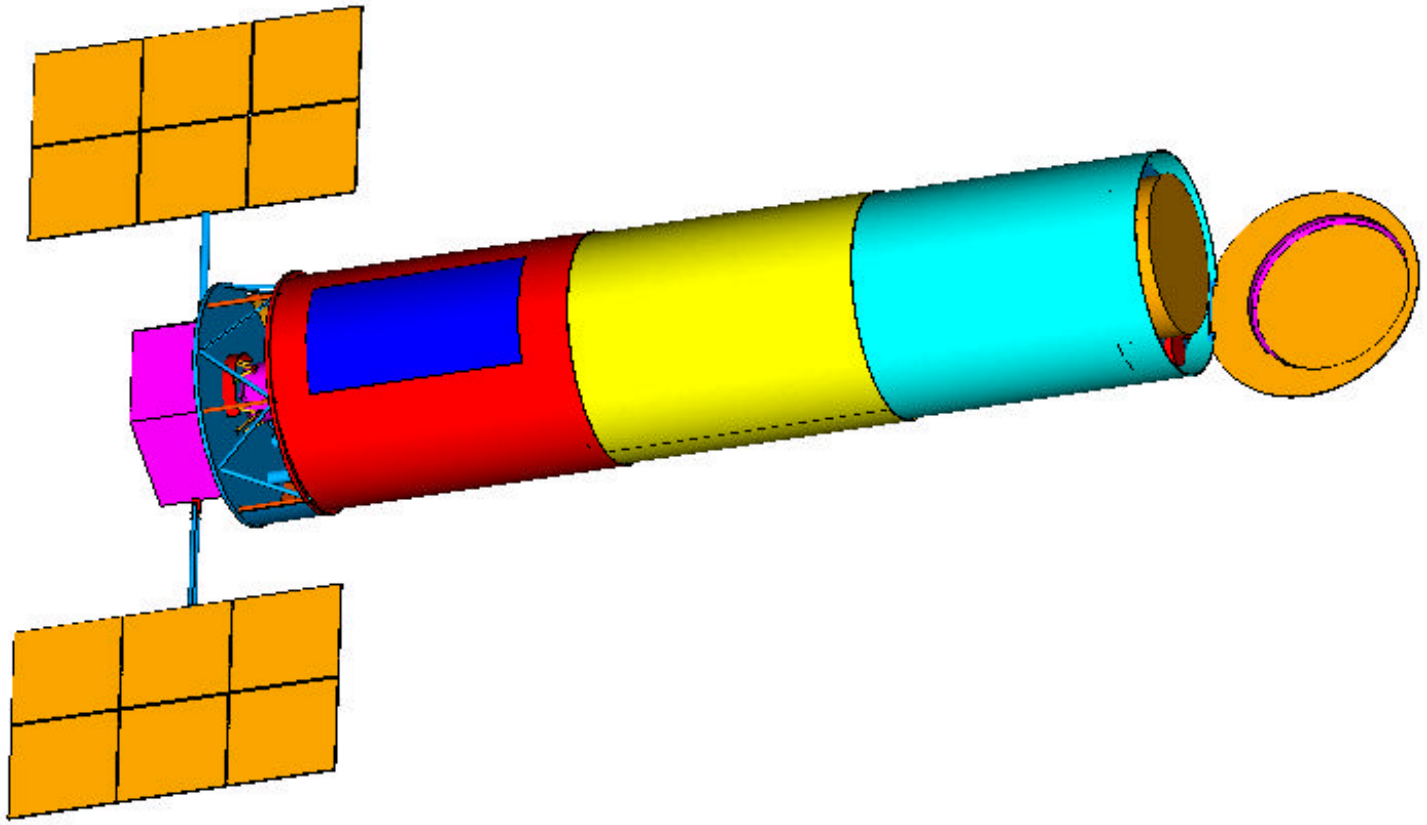
DIIIL21.3Mx2 - TOPVIEW

L2 - 3 S/C



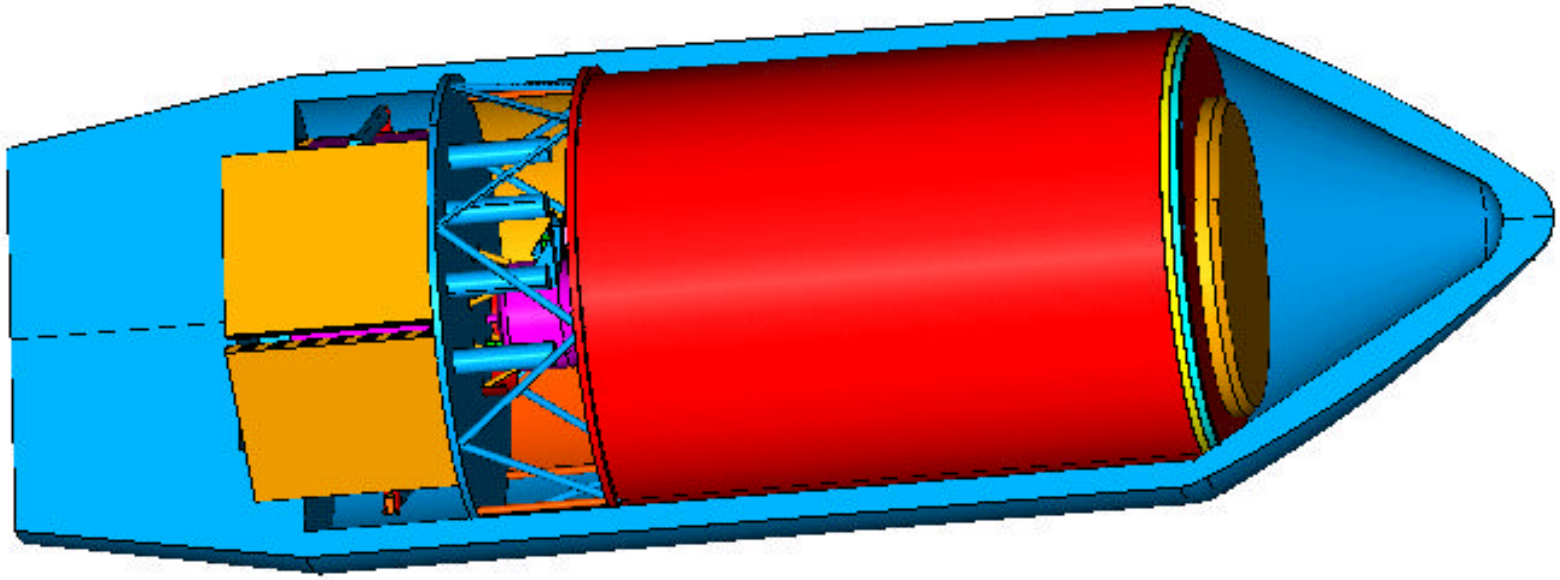
DIIIL21.3Mx2 - DETECTOR END

LEO - 4 S/C



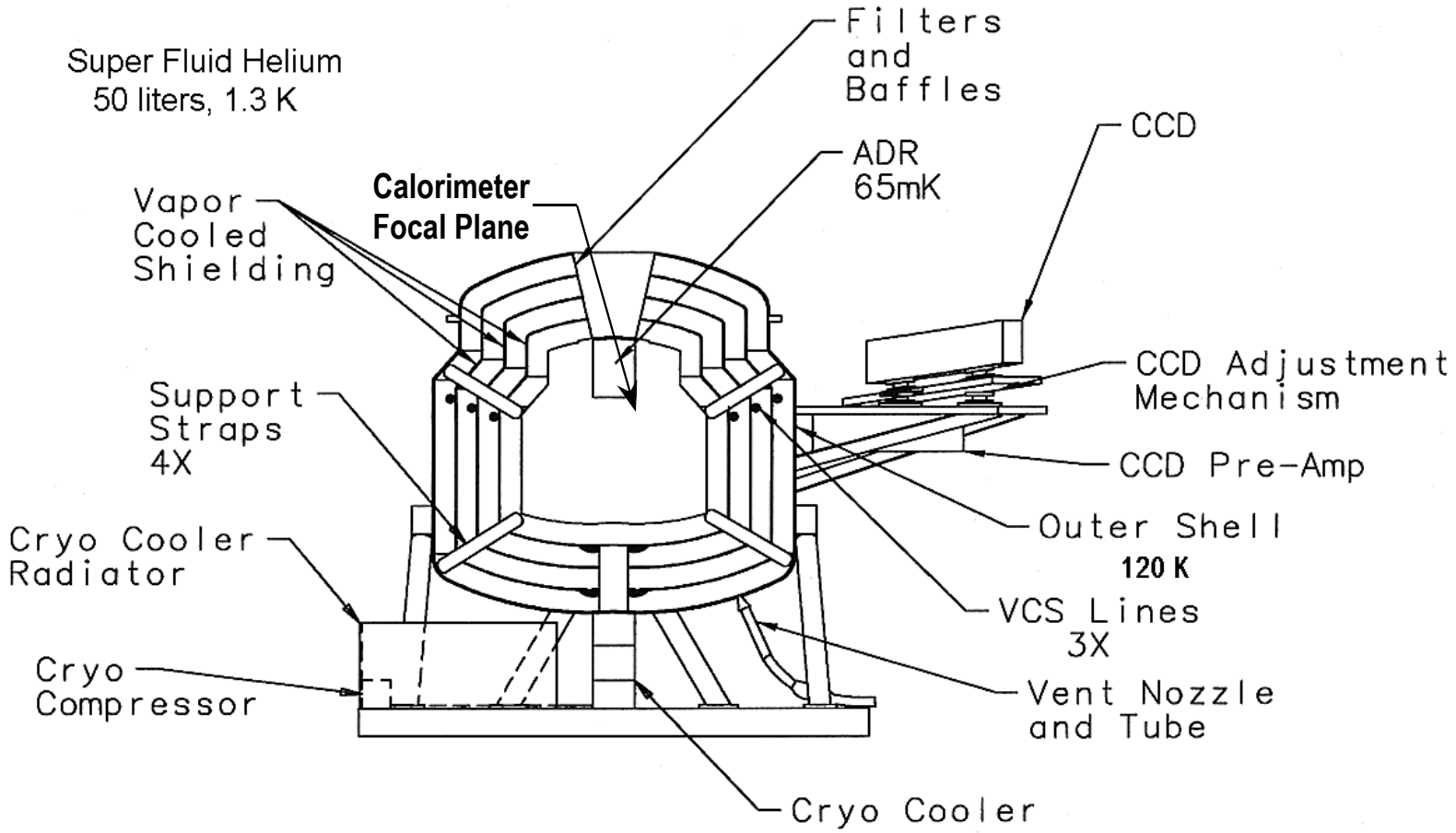
DIILEO1.8M - DEPLOYED

LEO - 4 S/C



DIILEO1.8M - STOWED

Schematic for Cryostat (L2)



Mass Estimates for Configurations Studied

Configuration	*Delta II, L2 Orbit, 6 S/C, 1.3M SXT @ 8.5M FL*	*Delta III/Atlas IIAR, L2 Orbit, 3 S/C, 1.3M SXT (2) @ 8.5M FL*	*Delta II, LEO Orbit, 4 S/C, 1.9M SXT @ 10.0M FL*	
ITEM	**WEIGHT (KG)**	**WEIGHT (KG)**	**WEIGHT (KG)**	**NOTES**
SXT				
Optic	412.0	824.0	1144.0	
CCD/Grating	98.0	196.0	118.0	Larger Grating
Cryostat	155.0	310.0	175.0	Increased mass for CPL and radiators
HXT				
Optics	78.0	156.0	220.0	4-40cm optics packaged
Detectors	51.0	102.0	68.0	4-40cm optics packaged
Payload Structure				
EOB	287.0	461.0	346.0	Shells, optic & det. bench, mech's & locks
INSTR. TOTAL	1081.0	2049.0	2071.0	
S/C BUS TOTAL	583.7	1106.5	1118.3	Calculated assuming a ratio of 35%
Spacecraft Total	1664.7	3155.5	3189.3	
Delta II 7925H-10L	1525.0			L2, C3 = -2.6
Delta II 7920H-10L			4300.0	LEO, 600km, 28.7°
Atlas IIARS		3300.0		L2, C3 = -2.6
Available Mass Margin	-9.2%	4.4%	25.8%	Margin available assuming ratio of 35%
Ratio of Instrument to S/C	64.9%	64.9%	64.9%	
Ratio of S/C Bus to S/C	35.1%	35.1%	35.1%	
Ratio of Instrument to S/C	70.9%	62.1%	48.2%	Ratios assuming 0% Margin
Ratio of S/C Bus to S/C	29.1%	37.9%	51.8%	
Ratio of Instrument to S/C	88.6%	77.6%	60.2%	Ratios assuming 20% Margin
Ratio of S/C Bus to S/C	11.4%	22.4%	39.8%	

Packaging Drivers/Approach

- Trades performed shaped philosophy w.r.t. the configurations
  - L2 Orbit
    - uninterrupted science observations
    - stable thermal environment
    - fixed solar arrays
  - Independent S/C Bus
    - clean interfaces to set requirements
    - instrument development/design not dependent on the bus
    - fully independent I&T programs at instrument and S/C level
      - no high fidelity simulators required
      - decoupled thermal analysis and test
      - full system level testing of instrument prior to delivery for I&T - mitigates risk